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SHORT COMMUNICATION

HETEROSIS FOR BIOMETRIC CHARACTERS AND SEED YIELD IN PARENTS AND HYBRIDS OF RICE (*ORYZA SATIVA* L.)

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A study was conducted to derive the heterotic vigour of rice hybrids viz., ADTRH 1, CORH 2 and their parents IR 58025 A, IR 58025 B, IR 66R, C 20R for six yield and yield attributing characters. On the basis of per se performance, the parent C 20 R was found to be the best for the traits number of tillers per plant, number of productive tillers per plant, 1000 grain weight and grain yield per plant. The hybrid CORH 2 was found to excel the performance of ADTRH 1 both in per se performance and in magnitude and direction of heterosis.

Key words: *Biometric traits, heterosis, hybrids, rice*

Rice (*Oryza sativa* L.) is the staple food crop in India and in developing countries of the world. As the population of India has crossed one billion, there is an imperative need to increase the production of food grains by employing improved new rice varieties [2]. Hybrid rice technology is the proven technology in China and a more practical one to raise production ultimately. It was obvious that the growing demand for food grains can be met only through hybrids. Hence, the present study was carried out in rice hybrids. As the increase of yield in rice hybrids can be achieved by hybrid vigour (i. e) heterosis, more emphasis is laid on this. Exploitation of heterosis is considered to be one of the outstanding achievements of plant breeding. To know the potentiality of hybrids, study on magnitude and direction of heterosis is very important. Heterosis, a valuable expression that often result from genetic combination, has been frequently utilized for development and identification of promising hybrids for further exploitation in conventional as well as heterosis breeding programme. Hence, in the present study relative heterosis, heterobeltiosis and standard heterosis of the biometrical traits and seed yield were analysed.

For the present study, two F_1 hybrids and their parents were collected and the study was carried out at Plant Breeding Farm, Department of Genetics and Plant Breeding, Annamalai University, Annamalainagar. Nursery was prepared with raised beds of 90 cm width. Two centimeter deep furrow lines were formed and seeds of each genotype were sown. The seedlings raised in the nursery were transplanted to the main field with a spacing of 15 cm within rows and 30 cm between rows. The adopted design was RBD (Randomized Block Design) with three replications and the season was Navarai (January – May). Observations were recorded from the randomly selected ten plants in each replication for the yield and yield attributing components like plant height, number of tillers per plant, number of productive tillers per plant, number of grains per panicle, 1000 grain weight and grain yield per plant. The heterosis was calculated as the difference of F1 from mid parent heterosis (MPH), standard heterosis (STH), and better parents heterosis (BPH). Heterosis was expressed as a percentage increase or decrease over MP (Mid Parent), SH (Standard Heterosis) and BP (Better Parent). The level of heterosis was tested using Student's "T" test. Heterosis measurement was simple and generally expressed as percentage increase or decrease in the performance of a hybrid in comparison with the reference variety or a parent [6].

The mean performance of the parents and hybrids are presented in Table - 1. On the basis of mean performance, the genotype CO 20 R was found to be the best parent for the traits number of tillers per plant (15.47), number of productive tillers per plant (13.90), 1000 grain weight (20.18g) and grain yield per plant (40.74g). The parent IR 66R was found to be the best for the trait, number of grains per panicle (149.58). Regarding the hybrids, CORH 2 was taller (89.00 cm) than ADTRH 1 (76.77 cm). The other yield attributing traits like number of tillers per plant (16.36), number of productive tillers per plant (14.69), number of grains per panicle (164.02), 1000 grain weight (22.57g) and grain yield per plant (54.62 g) were found to excel the performance of ADTRH 1.

In CORH 2, the relative heterosis, heterobeltiosis and standard heterosis were maximum for the character grain yield per plant (76.02, 34.07 and 54.47). The hybrid CORH 2 recorded positive and significant relative heterosis (11.77) and heterobeltiosis (4.45) for plant height. Negative significant standard heterosis (-3.72) was also obtained for this character. While the hybrid ADTRH 1 recorded the heterotic vigour in negative direction for the character plant height, similar findings were reported by [4]. Better segregants for dwarf plant types to

Table- 1 Mean performance of parents and hybrids for yield and yield attributing characters in rice.

Sr. No	Characters	Parents			Hybrids		
		IR 58025A	IR 58025B	IR 66R	CO 20R	ADTRH 1	CORH 2
1.	Plant height (cm)	85.17	85.21	73.81	74.05	76.77	89.00
2.	Number of tillers per plant	10.22	10.31	15.38	15.47	13.17	16.36
3.	Number of productive tillers per plant	8.05	8.11	11.95	13.90	12.18	14.69
4.	Number of grains per panicle	82.20	138.05	149.58	144.94	155.95	164.02
5.	1000 grain weight (g)	19.00	19.04	20.15	20.18	20.10	22.57
6.	Grain yield per plant (g)	14.25	21.32	36.03	40.74	38.19	54.62

Table- 2 Relative heterosis (di), heterobeltiosis (dii) and standard heterosis (diii) for yield and yield attributing characters in rice.

S.No	Characters	ADTRH 1			CORH 2		
		Relative heterosis	Heterobeltiosis	Standard heterosis	Relative heterosis	Heterobeltiosis	Standard heterosis
1.	Plant height (cm)	-4.13**	-10.48**	-17.60**	11.77**	4.45	-3.72**
2.	Number of tillers per plant	2.37**	-14.37	-6.79	26.92**	5.57**	15.78**
3.	Number of productive tillers per plant	20.59**	1.92	-7.59**	33.48**	5.68**	11.46**
4.	Number of grains per panicle	8.07**	4.26**	16.94**	15.92**	13.16**	22.99**
5.	1000 grain weight (g)	2.66**	-0.25**	-0.10**	15.09**	11.84**	12.18**
6.	Grain yield per plant (g)	33.62**	26.00	38.00**	76.02**	34.07**	54.47**

** 1% level of significance

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prevent plant lodging can be obtained from this cross in subsequent generations. The hybrid CORH 2 recorded positive significant relative heterosis, heterobeltiosis and standard heterosis for all the biometric characters like number of tillers per plant, number of productive tillers per plant, number of grains per panicle, 1000 grain weight and grain yield per plant. Such positive heterosis might be attributed due to both epistasis and dominance. Similar findings were concluded by [3] for total number of tillers, [1] for number of productive tillers and [5] for 1000 grain weight. The hybrid ADTRH 1 showed low heterosis in negative direction for most of the characters like number of tillers per plant and 1000 grain weight. This expression of negative heterosis may be attributed to non–allelic interaction which can either increase or decrease the expression of heterosis.

In the hybrid CORH 2 for most of the cases, significant positive heterosis for grain yield was associated with heterosis for number of tillers per plant, number of productive tillers per plant, number of grains per panicle and 1000 grain weight. This indicated that heterosis for grain yield was through heterosis from individual yield component.

In general the hybrid CORH 2 recorded significantly positive heterotic vigour for all the biometrical traits when compared to the hybrid ADTRH 1 suggesting that exploitation of such hybrid could be more rewarding for breeding programmes in rice improvement.

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